

impossible to reconcile a period so exalted with the ceiling of the so-called Memnonium and the date of the heliacal rising of the dog-star on the calendar of Thothmes III. at Elephantine. Every fact connected with the Exodus is a subject of continual dispute, dates, line of march, names of the Pharaohs, place of the House of Bondage whence the Jews swarmed out. The only safe view to take is that the problem is insoluble, and that its resolution should be tied up with the sheaf of paradoxes collected by De Morgan. Mr. Villiers Stuart found the cultivation of sugar prosperous, by means, though, of that apology for slavery "forced labour," and he is indignant at the sufferings of the unhappy fellaheen, as also at the urgent scheme of taxation and the system of baksheesh and official bribery which pervades the modern as extensively as it did the ancient land of bondage; but *corvées*, it appears, are necessary for the payment of Daira bonds, and "the drachm," as in the Roman times, must be wrung out of the hard hands of peasants. While however glancing at the modern state of Egypt the interest of the writer is concentrated on the Egypt of the past, Pharaohs, their queens and their princesses, and a fair popular account is given of Thebes. His weakness is a love of dabbling in etymology, and venturing out of his depth on general questions of comparative philology. Although, for example, an occasional word may resemble its Greek or Latin equivalent, the construction of the hieroglyphic or old Egyptian and the Coptic is totally different from those two classical tongues, the Egyptian having a closer resemblance to the Semitic than the Aryan or Indo-Germanic languages. As to the Etruscan, the few known facts about its construction point to the Turanian or Tartaric family rather than the Egyptian. The origin of the Egyptians is still involved in obscurity, and belongs to the province of conjectural ethnology. More Caucasian in the north and at the earliest period, more Nigritic on the south and at a later epoch, the Egyptians seem historically a mixed race, a fusion of conterminous races of Northern Africa, and Eastern foreigners, and Nigritic blood. The oldest inhabitants still remain a mystery. One theory is that the Egyptian was the primitive man of a vast continent, the last representative being the aboriginal Australian. Amongst other interesting points are visits to the Der-vishes, especially the fortune-tellers, and a description of the ride of the Sheikh of the Saidieh over the bodies of living men, who must have suggested to the apostle, had he seen him, the subject of Death on the Pale Horse. Like the car of Juggernaut, the Sheikh of the Saidieh is said to have been abolished. The ceremony might have been the relic of an old Egyptian one, and Pharaoh riding over his prostrate enemies may have anticipated the Sheikh of the Saidieh. Altogether the work is entertaining and amusing; it is not so dry as a guide or handbook, nor so learned as an Egyptological history such as that of Brugsch-Bey, nor so elaborate as Wilkinson's Manners and Customs, and Topography, or other travels by professed Egyptologists; but its style is light and sparkling, and the principal details of history, mythology, and archæology have been fairly mastered. In the minute details of philology it is weak, but they do not affect the general reader, and are easily set right *en passant* by the expert. They will do no harm to scientific research, and they will amuse and to some extent instruct the public. The plates

are also fairly done, and their colouring renders them more than usually attractive. It is decidedly agreeable to while away the monotony of a voyage down the river of the desert, as the Nile may be justly styled, and to those whose only travels are round their room, it will convey some pleasing impressions of what a visit to Egypt might show them.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

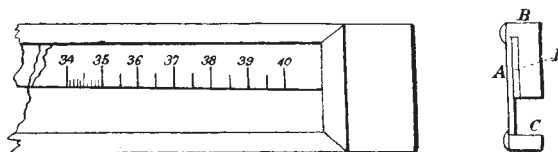
[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

Improved Arrangement of Scale for Reflecting Instruments

THE inconvenience resulting from the position of the scale in the ordinary well-known form of Thomson's reflecting galvanometer must have been experienced by all who have had occasion to use it much, and especially by myopic individuals. This I have been able to eliminate very easily, as hereafter described, so that there is no further craning over to see "the spot," or getting in one's "light" in so doing.

The scale is mounted as shown in the sketch, which gives a front view of one end of the scale and a cross-section of the same.

B is a wooden scale-board with longitudinal slot, as shown at C; P is the paper scale, cut so that all the division lines reach the inferior edge; A is a slip of plane glass, finely ground as to its lower half on the side towards C, from one end of the slip to the other; the scale is so placed that the lower end of the division lines just touches the ground part of the glass slip. The image of the slit with a fine wire stretched across it is focussed in the ordinary manner on the ground part of the glass, and will of course be clearly seen by the observer on the opposite side of the scale; as the line and printed divisions are in the same plane, there is no parallax; and a great increase in accuracy of



reading the position of the hair line is obtained, owing to the greater ease of observing that two lines coincide when end on to one another than when superimposed; and further, from the circumstance that the room need not be darkened.

This arrangement has been introduced at the beginning of this year by me in the testing-room of Messrs. Siemens Brothers and Co. at Woolwich, and has been most readily accepted by all my assistants, and I venture to say that any who adopt this arrangement will never return to the previous form.

I may state that I place the lamp and its slit on one side and reflect the beam of light on to the galvanometer by a mirror or total reflection prism, and further by means of two long plane mirrors reduce the actual distance between the galvanometer and scale, so as to have everything close to the observer's hand. The scale I have adopted is divided into half millimetres, and it is perfectly easy to read to a quarter of a division, and with a hand magnifying-glass still further.

This method is of course applicable to any physical instruments which are read by a reflected spot, and as there are no "patent rights" it is placed at the disposal of all.

Charlton

F. JACOB

A Note on Flame-Length

THREE years ago, whilst endeavouring to make use of flame-length as a means of testing the economic values of different qualities of coal-gas by the determination of their specific flame-

lengths, I was led to the discovery of some simple relations, the further study of which will perhaps one day help to simplify the theory of flames. By specific flame-length I mean the length of flame of a combustible gas burning in a normal atmosphere at a standard rate through a simple circular orifice under such conditions as to produce a symmetrical, vertical, steady flame capable of being measured. These conditions are not difficult to obtain in the case of coal gas. In fact for a very long time a flame-length test has been in use amongst gas-makers, but as the comparison has not always been made on the basis of volume the results have not always been satisfactory. The system I advocated was that of stating the flame-length for some standard rate. It occurred to me at that time that the flame-length should be proportional to the consumption or rate of issue of the gas. On submitting this theory to experiment I obtained satisfactory evidence that such was the case, as the following table taken at chance from a series of experiments will show:—

Flame-length. Inches.	Rate of consumption per hour. Cubic feet.	Calculated rate for 10" flame. Cubic feet.
2	75	3'75
3	1'13	3'77
4	1'5	3'75
5	1'85	3'70
6	2'25	3'75
7	2'6	3'71
8	2'98	3'72

I have therefore formulated the following laws:—

1. That the flame-length of a combustible gas is proportional to the consumption.

2. That the flame-length is the distance travelled by a gas in obtaining oxygen for its consumption.

3. That the flame-lengths of different gases are proportional to the relative amounts of oxygen required for their combustion.

The last remains to be proved, and I have been led to experiment upon simple gases such as hydrogen, carbonic oxide, and sulphuretted hydrogen, with the object of determining their specific flame-lengths; but these gases give flames offering great difficulties in measurement. The flames given by coal-gas under suitable and easily-obtained conditions offer no difficulty, but I have not been able at present (owing to the difficulty mentioned above) to obtain very satisfactory results with the above-mentioned three simple gases. Other simple gases have suggested themselves, but the cost of preparing them in a state of purity in sufficient quantity has at present prevented their use. However, with regard to sulphuretted hydrogen and carbonic oxide, I have found their flame-lengths stand in the relation of 3'2 to 1.

In view of the difficulty of measuring the flames of these simple gases I am about to effect the determination by indirect means. By preparing mixtures of known composition that will give easily-measurable flames, I hope to be able to throw some light upon this subject of flame-lengths.

March 22

LEWIS T. WRIGHT

Future Development of Electrical Appliances

As many of your readers have doubtless read Prof. Perry's interesting paper on the future development of electrical appliances, a remark on one or two points might not be out of place. In speaking of the application of electricity to railway travelling, Prof. Perry says that the weight of the train would be much reduced under the proposed conditions, and rail friction would be minimised. It strikes us that to have light trains would not be altogether an advantage, for several reasons. The lighter the train the less profitable would be the *vis viva* against a strong wind (and the latter is an important element in railway locomotion). Again, the stability of a heavy carriage is much greater than that of a light one, and a heavy engine in front of the train must steady the whole system. It would be interesting to ascertain from a practical engineer whether a train of six coaches with self-propelling powers could safely run at a speed of fifty-eight miles an hour.

GEORGE RAYLEIGH VICARS

Woodville House, Rugby

Prehistoric Europe

I AM sorry to have to ask you again to allow me to correct some statements made by Prof. Dawkins in the matter of the Victoria Cave explorations (NATURE, vol. xxiii. p. 482).

1. He says that "the antiquity of man in the Victoria Cave is solely due to the *perferendum ingenium* of Mr. Tiddeman. It was first based on a fragment of fibula which ultimately turned out to belong to a bear. Then it was shifted to the cuts on two small bones." It is not, I believe, usual in the arena to hand over your own broken disabled weapon to your adversary to defend himself with when you take a new one. Yet this appears to be one of Prof. Dawkins's tactics. Who, reading the above remark, would believe that Prof. Dawkins ever held the following opinion? "Although the fragment [of the fibula] is very small, its comparison with the abnormal specimen in Prof. Busk's possession removes all doubt from my mind as to its having belonged to a man who was contemporary with the cave-hyena and the other Pleistocene animals found in the Cave" ("Cave-Hunting," p. 120.)

So far from the evidence having been "shifted" to the two small bones, on the breaking down of the fibula evidence, the latter event happened in 1878, whereas attention was called to the former in the Reports for 1875-6, the respective years of their discovery.

2. "The bones are recent," says Prof. Dawkins. "This is evidently a very old bone," said Prof. Busk, after inspecting and experimenting on one of them submitted to him; and the whole of the circumstances of its discovery confirm that opinion.

3. "The cuts have been probably made by a metallic edge." That is a mere opinion, and to show what it is worth I may remark that at the discussion at the Anthropological Institute in 1877, when Prof. Dawkins stated that the marks looked as if they had been made with a Sheffield whittle, another member, at least equally distinguished, and apparently equally desirous to oppose the evidence, said that the marks seemed to have been made by a rock slipping across the bones.

4. Prof. Dawkins states that there were frequent slips of the materials after I took charge of the work. He has, I think, been misinformed, for his own visits to the Cave during that period were not sufficiently frequent to warrant any such statement, and our endeavour was to work the Cave in such a method as would entirely prevent the possibility of such accidents and the mixture of the remains.

5. Prof. Dawkins goes on to show:—(1) Either that Dr. Geikie and I believe that "there is evidence of inter-glacial or pre-glacial man, possessed of domestic animals, and probably using edged tools of metals" (which we certainly do not); or that (2) in his opinion goat has never existed anywhere save as a domesticated animal, for his remarks proceed upon one or other of these two assumptions.

6. Bones of goat were far from uncommon in the hyena-bed of the Cave, and found under such circumstances as would render their slipping down from higher beds quite impossible. The same is the experience of that distinguished explorer, M. E. Dupont, Director of the Geological Survey of Belgium, in the caves of that country:—"J'en maintiens absolument la co-existence avec ces espèces perdues" (*Journ. Anthropol. Inst.*, vol. vii. No. 2, p. 168). Unfortunately the non-existence of goats in Pleistocene deposits in Great Britain has been elevated to a dogma, and when the animals are found in such association it is immediately assumed that they have slipped from above—a confession to a very slipshod method of working—or, that the beds have previously been disturbed. All such cases should be most carefully inquired into and observed at the time without prejudice.

7. Again, Prof. Dawkins says that I wrote that the fact of the finding of reindeer with the earlier Pleistocene animals was "noteworthy," and that it is now too late to recall it. I do not recall my statement, but I should like it quoted correctly. "Your reporter had an impression that the reindeer remains occurred at some height above the hyena-bed.¹ Be that as it may, Prof. Dawkins's opinion² is entitled to great weight, and is indeed the view generally held. At the same time, considering that hyena and reindeer are not uncommonly found together in caves, when, as in this case, we see them mixed together at one or both ends of a section, but separated through an interval of seventy feet in length by a thickness of deposits, we may regard the fact as at least an interesting one, and, when found, noteworthy" (*Brit. Assoc. Reports*, 1876, p. 118). Prof. Dawkins shall have the whole of that. I will not recall even the middle sentence.

R. H. TIDDEMAN

Hastings, March 26

¹ This was also the opinion of Mr. Jackson, our painstaking superintendent, who was daily at the Cave.

² *i.e.*, of the co-existence of these animals.